



## ELECTRICAL MULTIPLE UNITS AND MAINTENANCE FOR THE RHINE-RUHR EXPRESS

# Desiro HC RRR

The RRR, a groundbreaking project for the Rhine-Ruhr metropolitan region, will alleviate the constantly growing transportation problems in the area starting in 2018.

This region is one of Europe's largest conurbations, with about 10 million inhabitants and many different transit routes. Along the main route between Cologne and Dortmund in particular, overburdened local public transport and train connections have substantially limited mobility for many years.

Thanks to the targeted expansion of the rail routes and the opportunity this offers to shift traffic from the roads to rail, the RRR is expected to make tens of thousands of car trips unnecessary each working day.

Since the end of 2018, the RRR Trains are in operation in the Rhine-Ruhr area and drive with top speeds of up to 160 kilometres per hour.

Once the rail infrastructure has been expanded, they will ultimately be expected to run at 15-minute intervals.

### The Desiro HC RRR

The RRR is designed as a four-car electrical multiple unit. The combination of single-deck tractive units and double-deck trailer cars will achieve higher passenger capacities, while arranging the major components on the roof of the end cars will facilitate maintenance and also help create more usable space inside the cars. By making full use of the vehicle gauge profile (EN15273-2, line DE2), more head and shoulder room is provided for passengers in the upper deck. Generous entry areas with wide access doors also enable rapid and safe boarding and exiting.

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### Interior design

The interior construction and attractive design, including the pleasant lighting and appealing, timeless color schemes, give the train a feeling of spaciousness, comfort, and safety.



### Energy savings

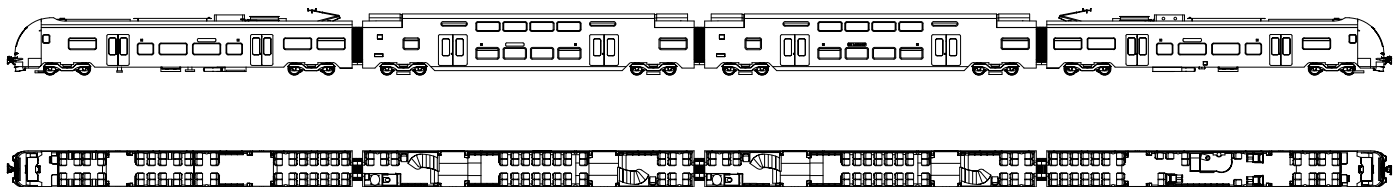
A range of technical facilities help the drivers save energy.

### Traction system

The RRX has an efficient traction system with traction power of up to 4,000 kW. With eight driven axles, this power can be transmitted even with a low friction coefficient, thus ensuring good dynamic performance.

### Vehicle communication infrastructure

The vehicle's communication infrastructure systems, Train Control Network (TCN) and Train Operator Network (TON), are Ethernet-based and form the basis for a service-oriented architecture (SOA) and communication. Our customers benefit from the Ethernet-based vehicle infrastructure in the form of state-of-the-art technology, while passengers enjoy the latest high-resolution CCTV and an innovative infotainment system and service staff benefit from comprehensive sensor technology for predictive maintenance.



### Technical data

Wheel arrangement	Bo'Bo'+2'2'+2'2'+Bo'Bo'
Track gauge	1,435 mm
Maximum speed	160 km/h
Traction power	4,000 kW
Starting acceleration	Up to 1.1 m/s <sup>2</sup>
Power supply	15 kV AC / 16.7 Hz
Passenger capacity	400 seats
Length of train	105,252 mm
Access height	800 mm (end car) and 730 mm (middle cars)
Width	2,820 mm
Car length	26,226 mm (end car) and 25,200 mm (middle cars)
Weight	200 t
Crashworthiness	TSI and EN 15227-compliant
Operating temperature	-25° C to +45° C (class T3 as per EN 50125-1)

### Vehicle details

- High-quality, timelessly elegant atmosphere in the interior fittings
- 36 comfortable, adjustable seats in first class, including reading lights and fold-away tables
- WiFi and outlets throughout the train
- Triple-unit traction capability
- Two standard restrooms in the middle cars
- One universal restroom in a lead car
- Barrier-free access in the end cars for passengers with wheelchairs or strollers
- Space for up to 18 bicycles
- LED lighting throughout the vehicle
- Energy-optimized air-conditioning control based on passenger numbers
- Air-suspended motor and trailer bogies from the SF 100 and SF 500 family
- Innovative infotainment system
- High-resolution CCTV cameras
- Ethernet-based train control and train operator networks



### Maintenance and repair

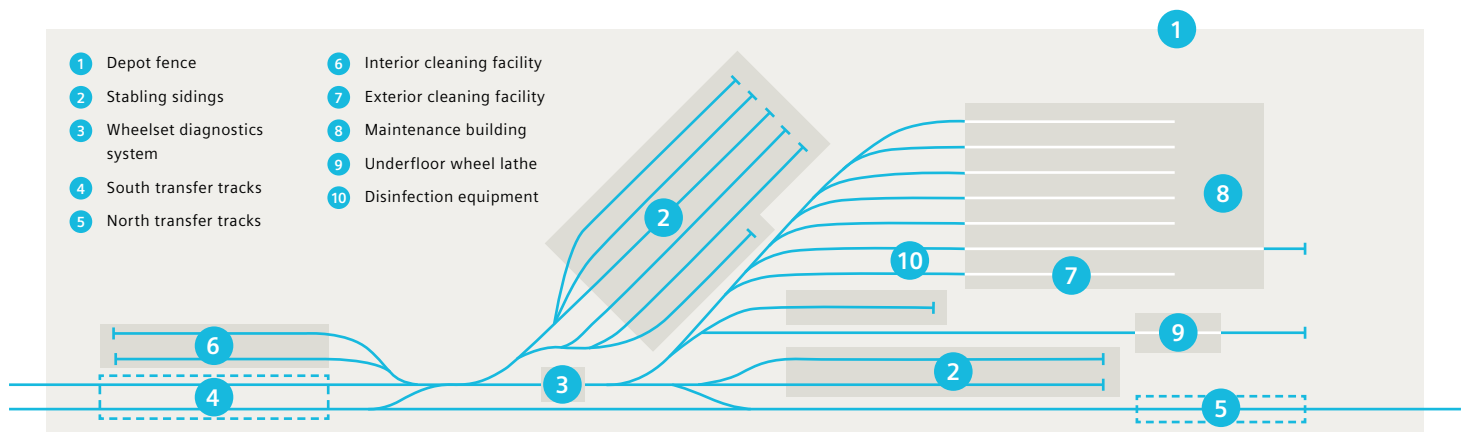
The order for the vehicles also included predictive service and maintenance for a period of 32 years and the construction of a digital and totally paperless depot in Dortmund-Eving.

### Depot

The Rail Service Center includes a six-track maintenance building, a three-story warehouse and social building, a gatehouse, outdoor storage areas, an exterior cleaning facility, an underfloor lathe for overhauling wheelsets, and a diagnostics system for wheelsets as part of a modern maintenance concept.

The depot also has a high-performance 3D printer for quickly and directly manufacturing spare parts that otherwise might not be available at short notice and/or at a reasonable cost.

Around 5.5 kilometers of track have been laid on the property, including the maintenance building. The depot began test operation in May 2018.





### Digital service

The contractual agreement was for over 99 percent availability of the 84 RRX trains. To ensure this, the trains are provided with a number of sensors that continuously transmit condition data to the depot. This makes it possible to plan measures in advance, including spare parts procurement and the provision of technicians, so that any faults can be corrected quickly and seamlessly as soon as the train arrives.

When trains enter the depot premises, they automatically pass a wheelset diagnostics system. The information acquired is automatically made available to maintenance personnel.

The Rail Service Center is responsible both for the technically faultless availability of all trains and for interior and exterior cleaning.



### Rail Service Center Dortmund-Eving: facts and figures

Total area	70,000 m <sup>2</sup>
Track length	5.5 km
Dimensions of main building	163 m x 63 m x 12.4 m (l x w x h)
Maintenance building	6 tracks
Number of employees	75 (at start of operations)

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Otto-Hahn-Ring 6  
81739 Munich  
Germany

[contact.mobility@siemens.com](mailto:contact.mobility@siemens.com)

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